ASSESSING PHARMACY PRACTICE GAPS WITH PN THROUGH TECHNOLOGY

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University of Texas MD Anderson Cancer Center

Disclosures
I have no commercial relationships relevant to the topic being presented.

Presentation Summary
A survey of parenteral nutrition (PN) practices reported that most institutions (60.2%) dedicate a 0.6 full-time equivalent pharmacist to verify and review PN orders. Pharmacists and pharmacy technicians must conduct both a clinical and pharmaceutical review of PN orders, however adequate training programs to conduct this training rarely exist with the dwindling number of board-certified pharmacists in nutrition support and minimal education provided in university-based pharmacy education.

Learning Objectives
At the completion of this program, pharmacists will be able to:

1. Describe how to identify professional practice gaps for parenteral nutrition use.
2. Assess the competency of healthcare professionals involved in the parenteral nutrition process.
3. Summarize how online educational modules can be used to address professional practice gaps and competency remediation.

Key Takeaways

1. Reviewing your organization's process for PN including prescribing, order review and verification, compounding, and administration can identify educational gaps for the healthcare professionals involved.
2. Institution of a PN order review and verification checklist specific to your organization as part of comprehensive education and training can increase pharmacy staff competence.

Self-Assessment Questions

1. Which of the following can identify educational gaps in regards to the parenteral nutrition process of prescribing, order review and verification, compounding, and administration?
   a. Voluntary reporting of errors.
   b. Transcription of original order.
   c. Verification of infusion rate.
   d. Application of label to the completed product.

2. Current recommendations advocate for pharmacy personnel involved in the review and verification of parenteral nutrition orders to demonstrate competency at least:
   a. Monthly.
   b. Quarterly.
   c. Biannually.
   d. Annually.

3. Pharmacy personnel involvement and application of technology in parenteral nutrition has been shown to completely eliminate errors in which of the following categories?
   a. Prescription.
   b. Transcription.
   c. Preparation.
   d. Administration.

Answers

1. A – Voluntary reporting of errors in the parenteral nutrition process of prescribing, order review and verification, compounding, and administration are most likely to reveal educational gaps in various healthcare professionals
2. D – In the latest PN safety consensus recommendations, pharmacists who review and verify PN orders should demonstrate competency at least annually as defined by the healthcare institution.
3. B – The use of a computerized provider order entry (CPOE) program that incorporates PN dosing with soft and hard stop recommendations can reduce prescribing errors and simultaneously eliminates the need for paper order transcription. An integrated CPOE program with an automated compounding device can also reduce transcription. A children's hospital was able to incorporate thirty developmental processes, resulting in practices that were compliant with A.S.P.E.N. PN safety consensus recommendations. The frequency of PN medication errors over 7 years was 230 errors/84,503 PN prescriptions, or 0.27%. After categorized errors by steps in the PN process (prescribing, transcription, preparation, and administration), there were no transcription errors, and most (95%) errors occurred during PN administration.

References

1. Boullata JI, Guenter P, Mirtallo JM. A parenteral nutrition use survey with gap analysis. *JPEN J Parenter Enteral Nutr.* 2013;37:212–22.
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9. Guenter P, Worthington P, Ayers P, et al. Standardized competencies for parenteral nutrition administration: The A.S.P.E.N. model. *Nutr Clin Pract.* 2018;33:295–304.
10. Sacks GS, Rough S, Kudsk KA. Frequency and severity of harm of medication errors related to the parenteral nutrition process in a large university teaching hospital. *Pharmacotherapy.* 2009;29:966–74.
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ASPEN 2019 Nutrition Science & Practice Conference

Assessing Pharmacy Practice Gaps with PN through Technology

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Disclosures

- I have no commercial relationships relevant to the topic being presented

Learning Objectives

Upon completion of this session, the learner will be able to….

1. Describe how to identify professional practice gaps for parenteral nutrition use
2. Assess the competency of healthcare professionals involved in the parenteral nutrition process
3. Summarize how online educational modules can be used to address professional practice gaps and competency remediation

How is PN safety measured at your facility?

- Patient safety or error event reporting (voluntary)
- Healthcare staff competency assessment
- PN ordering revisions within electronic medical record
- Policy & procedure revisions based upon best practices

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ASPEN Safe Practices for Parenteral Nutrition

0148-6071/04/2806-0S3(0)$02.00/0
JOURNAL OF PARENTERAL AND ENTERAL NUTRITION
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Printed in U.S.A.

Special Report

Safe Practices for Parenteral Nutrition

Task Force for the Revision of Safe Practices for Parenteral Nutrition: Jay Mirtallo, MS, RPh, BCNSP, Chair, Todd Canada, PharmD, BCNSP, Deborah Johnson, MS, RN, Vanessa Kumpf, PharmD, BCNSP, Craig Petersen, RD, CNSD, Gordon Sacks, PharmD, BCNSP, David Seres, MD, CNSP, and Peggi Guenter, PhD, RN, CNSN

APPROVED BY A.S.P.E.N. BOARD OF DIRECTORS JULY 21, 2004

ASPEN Parenteral Nutrition Safety Consensus Recommendations

Clinical Recommendations

A.S.P.E.N. Parenteral Nutrition Safety Consensus Recommendations

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Abstract

Parenteral nutrition (PN) serves as an important therapeutic modality that is used in adults, children, and infants for a variety of indications. The appropriate use of this complex therapy aims to maximize clinical benefit while minimizing the potential risks for adverse events. Complications can occur as a result of the therapy and as the result of the PN process. These consensus recommendations are based on practices that are generally accepted to minimize errors with PN therapy, categorized in the areas of PN prescribing, order review and verification, compounding, and administration. These recommendations should be used in conjunction with other A.S.P.E.N. publications, and researchers should consider studying the questions brought forth in this document. (*JPEN J Parenter Enteral Nutr.* 2014;38:296-333)

Have you read the Safe Practices for PN and the PN Safety Consensus Recommendations?

- Yes, I have read both articles
- No, I have only read one of them
- No, I have not read them
- My facility never makes mistakes so I don't need to read them

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Initiating PN Event

- Incident of incompatible PN for ICU patient
  - Involved specialty amino acid (Hepatamine 8%) with large dose of calcium gluconate, but no additional phosphate added
  - Not filtered and same PN administered for the previous 3 days
    - Continued patient deterioration resulting in ICU admission
  - PN stopped & solution was clear at room temperature
    - Warmed to 37°C for 30 minutes with visible precipitation
- Review of PN orders from 1999 – 2001
  - 35 incompatible PN orders written, compounded & administered
    - Involved 2 physicians, 9 clinical pharmacy specialists, 19 staff pharmacists, 3 outsource facility pharmacists, 5 certified pharmacy technicians

Initial PN Gap Analysis Education

During your employment at MD Anderson, you have entered numerous TPN orders into Datastat.

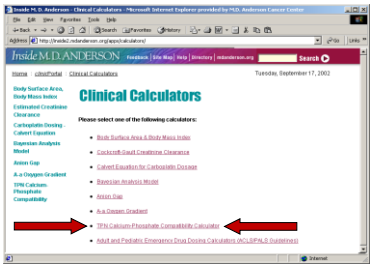
I would like to ask for your evaluation of the following order number _____ for compatibility.

In an effort to understand our current system, I am asking for your assistance in answering the following compatibility questions regarding the above order number:

☛ Please outline the steps to determine if this TPN is compatible. Please

28 Pharmacists
Individually tested & remediated

PN Resources Created



Subsequent PN Gap Analysis from Voluntary Error Reporting

2002 PN Errors (n = 32)

- **Order entry problems**
  - Wrong unit entered
    - mL instead of mEq
  - Wrong amino acids solution
    - TrophAmine for Travasol
  - Item added but not ordered
  - Additive omitted
- **Involved 18 different pharmacists**

Patient Outcomes

- **4 errors that resulted in need for ↑ monitoring**
  - KCl 100 instead of 60 mEq
  - NaCl 560 instead of 140 mEq
  - Insulin added instead of Pepcid
    - Altered PN order form

Pharmacy Administrative Response to PN Gap Analysis from Error Reporting

Subject: TPN incident #24772 - trace elements not crossed out on 1/14/10

Hi Todd,

Incident report #24772 brings to the point that pharmacists did not check previous day TPN orders.

I want to bring to your attention that our floor pharmacists usually do not have enough time to double check previous day TPN orders. They have also been instructed not to clone TPN or chemo orders so as not to perpetuate mistakes.

Which of the following can identify educational gaps in regards to the parenteral nutrition process of prescribing, order review and verification, compounding, and administration?

- Voluntary reporting of errors
- Transcription of original order
- Verification of infusion rate
- Application of label to the completed product

PN Competency – Clinician vs. Compounder

MD Anderson Nutrition Support Responsibilities

Initial Consult

1. Obtain the patient name, medical record number and room location (*if known*)
   - Notify the nutrition support dietitians of the new consult (*to prevent duplication of work*)
   - Identify if an access device is available (*central venous catheter, implanted port, peripherally-inserted central catheter, peripheral IV only, gastrostomy tube, jejunostomy tube, etc.). Parenteral nutrition (PN) must be administered through a dedicated lumen of a central line.*
2. Check to see if the patient has been on PN previously by searching notes for those written by an RD or PharmD on the nutrition support team
   - Chart Review → Notes → Filters → Author Type → Choose Clinical Dietitian, Clinical Pharmacist and Pharmacist
3. Complete the nutrition support profile (*available as an electronic form; also on Box – ask the nutrition support pharmacist or dietitian for a copy*) including the cancer and admission diagnosis, medical and weight history, nutrition support indication, vital signs, laboratory data, ins and outs, medications (*screening for drug-nutrient interactions*) and past (*24-72 hours*) electrolyte replacement prior to meeting with other team members (*use the OneConnect tip*

PN Competency Safety Assessment

Parenteral Nutrition Competency Assessment

Employee Name _____ ID# _____

Signature _____ Date: _____

Score: _____ Evaluator: Todd Canada

1. A 52-year-old male who recently completed his preoperative chemotherapy and radiation therapy for colon cancer is electively scheduled for surgery in 1 week. His weight was 88 kg at diagnosis 5 months ago, had fallen to as low as 76 kg 6 weeks ago, and is now currently 74 kg. He reports being depressed while his appetite and weight have not improved over the last 2 weeks. What is his subjective global assessment?
   - A. Well nourished
   - B. Moderate malnutrition
   - C. Severe malnutrition
   - D. Unable to determine
2. You see a 72-year-old female patient who has experienced a 16% weight loss over the last 6 months with underlying chronic hypertension, end-stage renal disease requiring hemodialysis 3 times/week, and now presents with an incarcerated ventral hernia with partial small bowel obstruction. What would be your best assessment of this patient's risks if she were to go to emergent surgery?
   - A. Lower mortality
   - B. Decreased postoperative complications
   - C. Increased postoperative complications
   - D. No difference in postoperative complications

73 Clinical Pharmacy Specialists

Mean ± SD: 69 ± 16

Range: 28-100

More PN Gap Analysis from Voluntary Error Reporting

31 PN errors reported from 2013
- 55% involved operational pharmacist
- 13% involved prescribing pharmacist
- 32% involved nurse

n **= 7145 PN orders**
4.3/1000 PN error rate
vs. published literature
15.6/1000

- **Most frequent PN errors related to**
  - 32% wrong drug
  - 26% wrong dose
  - 3% wrong patient
  - 13% wrong rate
  - 10% wrong administration
  - 13% wrong timing
  - 3% wrong route
- **94% of PN errors reached patients**
  - 48% causing harm
  - 59% requiring an intervention
  - 41% requiring additional treatments

More PN Resources Created

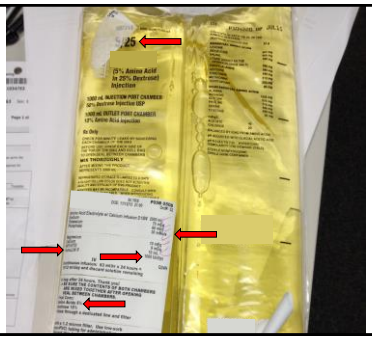
Verify TPN order for:
- ☐ Patient name and medical record number
- ☐ Age
- ☐ Allergies and associated reactions
- ☐ Dosing weight
- ☐ Peripheral vs. central venous access device
- ☐ Date and time order submitted (*no orders accepted after 5 pm – page Nutrition Support to address*)
- ☐ Administration date and time (*9 pm*)
- ☐ Type of TPN order (*New, Change or Same*)
- ☐ Type of Base formulation (*Standard, High Protein or Non-standard*)
- ☐ Continuous or cyclic
- ☐ TPN infusion rate, duration and volume
- ☐ Dose listed for each electrolyte salt
- ☐ Check IV fluids for concurrent potassium as maximum rate 20 mEq/hr centrally or 10 mEq/hr peripherally
- ☐ Dose for multivitamins (*10 mL for adults, 5 mL for pediatrics*)
- ☐ Dose for multiple trace elements (*3 mL of MTE-5 or 1 mL of MTE-5 Concentrate*)
- ☐ Dose for Zinc (*if ordered*)
- ☐ Dose for famotidine (*if ordered*)
- ☐ Check for duplication of famotidine IVPB in Centricity profile (*if ordered*)
- ☐ Dose for regular human insulin (*if ordered*)
- ☐ Dose for other additives (*Copper, Selenium, Thiamine, Folic acid, Cyanocobalamin*)
- ☐ Fat emulsion volume, infusion rate, frequency and duration (*if ordered*)

Check TPN Calcium-Phosphate Calculator for:
- ☐ Appropriate dosages of each component or additive (*out-of-range values will appear in red and require further investigation*)
- ☐ Compatibility of calcium gluconate and sodium/potassium phosphates with selection of appropriate curve
- ☐ **Compare TPN order to previous day's order to assess component doses for substantial changes**
- ☐ **Perform independent double-check for transcribed order data prior to compounding**

PN Order Review and Verification Checklist

Current recommendations advocate for pharmacy personnel involved in the review and verification of parenteral nutrition orders to demonstrate competency at least:

- Monthly
- Quarterly
- Biannually
- Annually



Development of Formal Pharmacy Education

- Provided ACPE-accredited CE with pre- and post-test assessment of all inpatient pharmacy staff

Introduction to Safe Management of Adult Parenteral Nutrition Therapy
(Universal Activity #: 0532-0000-14-003-H05-P)
January 2014 through January 2017 Report (n=214)

Average Scores

Department	Pre-test*		Post-test**		Difference
	%	n	%	n	
All	**69**	***214****	**91**	***214***	**+ 22%**
Pharmacy Inpatient	67	*103**	90[a]	*104*	+ 23
Pharmacy Clinical Programs	72	*71*	93[b]	*71*	+ 21
PGY2	69	*9*	93[c]	*9*	+ 24
PGY1	73	*9*	92[d]	*9*	+ 19

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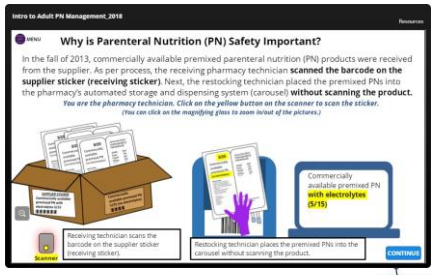

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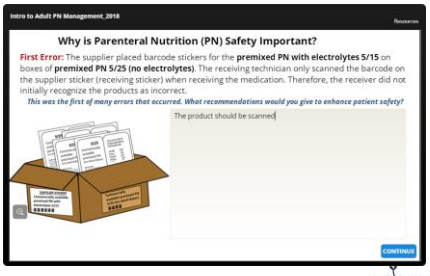

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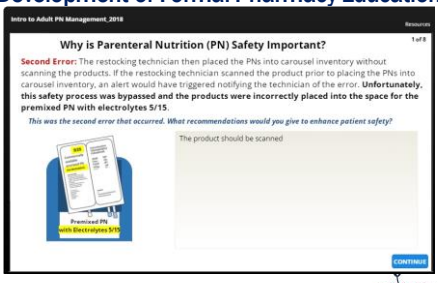

Development of Formal Pharmacy Education

Intro to Adult PN Management_2018 — Resources

Why is Parenteral Nutrition (PN) Safety Important?

During this time, a prescriber ordered 2 liters of **premixed PN with electrolytes 5/15**. The **only additives included multivitamins 10 mL/day**. The order was routed to a floor pharmacist for order entry into the pharmacy system.

Third Error: The floor pharmacist is often distracted by other orders, noise, and interruptions. Unfortunately, this order was processed incorrectly. **The order specifically omitted insulin. However, the pharmacist skipped a line in the order entry process and mistakenly entered 10 mL of regular insulin (1,000 units) in addition to 10 mL of multivitamins. An independent double-check by another pharmacist was not performed.**

This was the third error that occurred. What recommendations would you give to enhance patient safety?

Limit distractions - potentially have dedicated pharmacist

CONTINUE

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Why is Parenteral Nutrition (PN) Safety Important?

Fourth Error: The PN label was routed for compounding. Contrary to established processes, **premixed PN 5/25 (no electrolytes)** was taken out of the automated carousel system without being scanned. Additionally, **1,000 units of insulin was checked off as being added per the label** along with the ordered 10 mL of multivitamins.

This was the fourth error that occurred. What recommendations would you give to enhance patient safety?

Scan products prior to compounding

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Why is Parenteral Nutrition (PN) Safety Important?

Fifth Error: The transcription and compounding errors were not detected prior to dispensing the final product from the pharmacy to the floor. **A final dispensing check was not done by a pharmacist**. The pharmacist assigned to this task claimed that he/she was unaware that a premixed bag needed verification prior to dispensing.

This was the fifth error that occurred. What recommendations would you give to enhance patient safety?

A check of the product to the order should be completed

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Why is Parenteral Nutrition (PN) Safety Important?

NEAR MISS

Fortunately, this PN was sent to a floor that routinely administers the medication and the **nurse correctly followed the institutional policy and checked the product with the original order. The error was detected before administration. However, this could have resulted in major harm or death.** Because the error was detected, pharmacy was able to check for other PN bags dispensed that evening. Five other patients received incorrect premixed PN solutions on the same night.

This event resulted in some immediate process changes. Many institutional and divisional changes have also occurred since 2013. ***Use the notes icon to review your safety recommendations and compare them to our current safety processes.***

Institutional and Division of Pharmacy Changes

Error 1: Based on a review of this event, a more stringent receiving procedure was put into place. To ensure mistakes from the supplier are caught before the item has been opened and restocked, a double scan was implemented. **Technicians must now scan the receiving barcode and the barcode on the actual product.**

CONTINUE

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Development of Formal Pharmacy Education

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MENU

Why is Parenteral Nutrition (PN) Safety Important?

Institutional and Division of Pharmacy Changes

Error 2: A safety process that could have alerted the technician of the incorrect product was bypassed. The carousel software cannot help detect errors if safety processes are routinely bypassed. Additionally, when the processes are followed and alerts are triggered, **they must be reviewed carefully prior to implementing the override process.** Staff education is ongoing.

Error 3: After the event, the **line items for insulin and multivitamin were separated** in the pharmacy order entry system to prevent future errors. Since this event, MD Anderson has implemented a new electronic health record (EHR) which increases prescribing safety. More recently, **a limited number of pharmacists have been specially trained and dedicated to review and verify PN orders.** Other safety processes have been implemented such as a verification checklist and independent double-check procedures.

Errors 4 and 5: Rotating dedicated pharmacists and pharmacy technicians are in place to compound and dispense both premixed PN products and PNs compounded using an automated compounder. This allows staff to gain confidence and experience with PN order verification and compounding. The new EHR and compounder system also contains additional scanning features that can help catch product selection errors prior to compounding.

Take Home Message: While safety features are made available with technology, they can be bypassed at any time. It is imperative that processes are followed to maximize the benefits of technology and minimize risk to patients.

How do your recommendations compare? Are they similar or would you recommend other changes? Review your current process and consider submitting your recommendations to your manager.

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MENU

Why is Parenteral Nutrition (PN) Safety Important?

Institutional and Division of Pharmacy Changes

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Your Safety Recommendation for Errors 4 and 5

Scan products prior to compounding

A check of the product to the order should be completed

How do your recommendations compare? Are they similar or would you recommend other changes? Review your current process and consider submitting your recommendations to your manager.

CONTINUE

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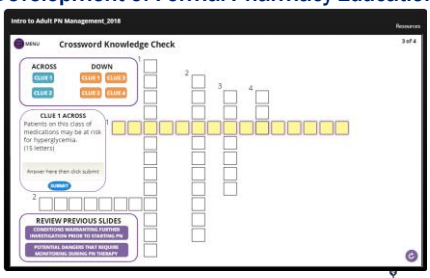

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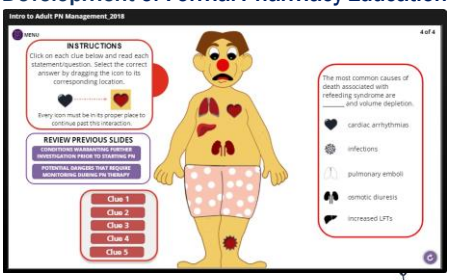
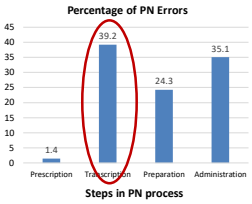


Pre-CPOE PN Safety Implications

- Prospective, observational study in a large teaching hospital with a nutrition support team, 4730 prescriptions for PN reviewed and 74 errors observed
  - Transcription and preparation accounted for 64% of PN errors
  - 8% contributed to or resulted in temporary patient harm
  - 15.6 errors/1000 PN prescriptions

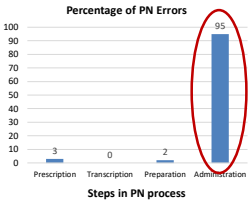
Sacks GS et al. *Pharmacotherapy.* 2009; 29:966-74.



Post-CPOE PN Safety Implications

- Observational study in a 350-bed urban pediatric hospital, 84,503 prescriptions for PN reviewed and 230 errors observed
  - 9.1% contributed to or resulted in temporary patient harm
  - 2.7 errors/1000 PN prescriptions

MacKay M et al. *Nutr Clin Pract.* 2016; 31:195-206.



Pharmacy personnel involvement and application of technology in parenteral nutrition has been shown to completely eliminate errors in which of the following categories?

Prescription

Transcription

Preparation

Administration

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References

1. Mirtallo J, Canada T, Johnson D, et al. Safe practices for parenteral nutrition. *JPEN J Parenter Enteral Nutr.* 2004;28(suppl):S39–S70 [published correction appears in *JPEN J Parenter Enteral Nutr.* 2006;30:177].
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